

Appl. No. 10/722,157
Amdt. Dated June 7, 2006
Reply to Office Action of March 8, 2006

Attorney Docket No. 81863.0024
Customer No.: 26021

REMARKS/ARGUMENTS:

Minor changes are made to this specification. Claims 1-5 and 14-30 are canceled without prejudice. Claims 6, 7, and 11-13 are amended. Support for the amendment to claim 6 can be found at p. 15, lines 3-7 of the Applicant's specification. Support for the amendment to claim 7 can be found at p. 18, lines 14-15 of the Applicant's specification. New claim 31 is added. Support for new claim 31 can be found at p. 17, lines 24-25 of the Applicant's specification. Claims 6-13 and 31 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The present invention relates to piezoelectric ceramics and a method of manufacturing the same, an actuator and a method of manufacturing the same, and a printing head and an ink jet printer and, more particularly, to piezoelectric ceramics and an actuator (i.e., multilayer piezoelectric pile) that are suitable for piezoelectric sensors, for example, acceleration sensor, knocking sensor, AE sensor or the like, fuel injector, printing head for ink jet printer, piezoelectric resonator, oscillator, ultrasonic motor, ultrasonic oscillator and filter, and can be advantageously used particularly for a printing head that utilizes vibration of 2-dimensional vibration of expansion and contraction or linear vibration in longitudinal direction or in the direction of the thickness, and a method of manufacturing the same, and a printing head and an ink jet printer. (Applicant's specification, at p. 1, lines 11-20).

SPECIFICATION:

The Office states that the claim terminology "crystals of at least one kind selected from the group consisting of alumina, beryllia, zirconia..." is not provided with antecedent basis by the specification. The Office further states that the

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specification does provide antecedent basis for the claimed compounds but does not provided antecedent basis for "crystal" of the claimed compound.

In response, Applicant changed "at least one kind" to -- crystal of at least one kind - in the specification. Withdrawal of this objection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 112:

Claims 11-13 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office states,

" In claim 11, the phrase 'the crystal' lacks antecedent basis. In claim 12, the phrase 'the green compact comprising a stock material powder' lacks antecedent basis. In claim 13, the claim recites a sealed space, a volume of a green compact and a heavy object but does not provide a link between the active positive steps and the catalog of parts claimed."

In response, the Applicant amended claim 11 so that it now depends from claim 9. Antecedent basis for the crystal can be found in claim 9. In claim 12, the Applicant changed "stock material powder" to -- piezoelectric ceramic powder--. Antecedent basis for "piezoelectric ceramic powder" can be found in claim 6. In claim 13, the Applicant changed "a sealed space" to --the sealed space--; "a green compact" to --the green compact--; and a heavy object was changed to a supporting member. The Applicant's specification at p. 15, line 22-p. 16, line 4 indicates that "heavy object" is equivalent to "supporting member." Antecedent basis for

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"supporting member" can be found in claim 6. Withdrawal of these rejections is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102:

Claims 6-10 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kimura (U.S. Patent No. 5,504,388).

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kimura (U.S. Patent No. 5,504,388). The Applicant respectfully traverses these rejections as to the amended claims.

In Kimura, the firing operation is carried out in the state that the piezoelectric/electrostrictive film 14 is inserted between the electrode films 12, 16 (Kimura, column 7, line 64-column 8, line 19). Therefore, after firing, the piezoelectric/electrostrictive film 14 and the electrode films 12, 16 are integrated, and the piezoelectric/electrostrictive film 14 is not separated for use.

In contrast, in claim 6 of the present invention, a green compact disposed on a supporting member is fired. Thus, the green compact and the supporting member are not integrated, and after firing, piezoelectric ceramics are separated from the supporting member. The specification does not clarify that after firing, the green compact is separated from the supporting member. However, it is apparent from the word "disposed" that it is separated (Applicant's specification, at p. 15, lines 3-7). In addition, it is described that the piezoelectric ceramics produced in Figs. 1 and 2 are used as the piezoelectric substrate 2 in Fig. 3 (Applicant's specification, at p. 20, lines 14-22).

Kimura discloses the porosity of the electrode film (Kimura, column 5, lines 49-60). However, Kimura defines the porosity of the electrode film higher because

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higher porosity may reduce the surface area of the electrode film and affect the electrical conductivity of the electrode film.

In contrast, in the present invention, the supporting member has porosity of 5% or less because the surface having a small porosity of the supporting member is dense, and therefore, degranulation barely occurs and the amount of particles to be deposited on the surface of the green compact decreases, thus making it possible to improve the flatness and surface roughness of the piezoelectric ceramics obtained by firing (Applicant's specification, at p 17, lines 4-10).

In light of the foregoing, Applicant respectfully submits that Kimura could not have anticipated or rendered obvious claim 6, because Kimura fails to teach or suggest each and every claim limitation. Claims 7-10 depend from claim 6 and cannot be anticipated or rendered obvious for at least the same reasons as claim 6. Withdrawal of these rejections is thus respectfully requested.

The art made of record but not relied upon by the Examiner has been considered. However, it is submitted that this art neither describes nor suggests the presently claimed invention.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

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Date: June 7, 2006

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